

Appl. No. 10/698,882
Response Dated January 17, 2005
Reply to Office action dated October 22, 2004

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims

1. (currently amended) A method of determining whether a flue is at least partially blocked in an HVAC system that includes a burner and a flue, wherein the flue serves as an exhaust port for the burner, the method comprising:
monitoring the intensity of a flame of the burner; and
determining if the intensity of the flame of the burner likely corresponds to an at least partial blockage of the flue;
operating the HVAC system in a number of heating cycles to maintain a desired temperature in an inside space relative to a temperature set point; and
performing both the monitoring and determining steps during at least one of the heating cycles.
2. (original) A method according to claim 1 wherein the monitoring step includes the step of determining a flame value related to the intensity of the flame.
3. (original) A method according to claim 2 wherein the determining step includes the step of comparing the flame value to a reference value.
4. (original) The method of claim 1 wherein the HVAC system includes a flame sensor that produces an output, the flame sensor being disposed to monitor the intensity of the flame of the burner, and wherein the step of monitoring the flame includes monitoring the flame sensor output.
5. (currently amended) The method of claim 2 wherein the flame value is related to ~~the~~ a flame sensor output taken at different times.

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6. (original) The method of claim 5 wherein the flame value is an average of the flame sensor output taken at different times.

7. (original) The method of claim 2 wherein the step of determining a flame value includes the steps of:

sampling the output of the flame sensor at a first time for a first output value and a second time for a second output value; and

averaging the first output value and the second output value.

8. (currently amended) The method of claim ~~[[1]]~~ 3 wherein the reference value can be reset to a new reference value.

9. (original) The method of claim 8 further comprising:
observing the flame value at a first time and a second time;
if the flame value varies by less than a predetermined amount from the first time to the second time, resetting the reference value to the new reference value.

10. (original) The method of claim 9 wherein the new reference value is an average of previous flame values.

11. (original) The method of claim 3 further comprising:
determining a difference between the flame value and the reference value;
if the difference exceeds a predetermined threshold, determining that the flue is blocked.

12. (original) The method according to claim 3 further comprising:
determining a difference between the flame value and the reference value;
if the difference exceeds a predetermined threshold for a predetermined duration of time, determining that the flue is blocked.

13. (original) The method according to claim 1 wherein the burner is disposed in a

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chamber, and the step of monitoring the intensity of the flame of the burner includes optically observing the intensity of light in at least part of the chamber.

14. (canceled)

15. (currently amended) A method according to claim [[14]] 1 wherein the monitoring and determining steps are performed more than one time during at least one of the heating cycles.

16. (original) A method according to claim 15 wherein the monitoring and determining steps are performed multiple times during each of two or more of the heating cycles.

17. (currently amended) A controller for used with an HVAC system, the HVAC system having a burner and a flue wherein the flue serves as an exhaust for the burner, the HVAC system further having a flame sensor for monitoring the flame of the burner, the controller comprising:

monitoring means adapted to receive and monitor an output signal from the flame sensor, wherein the output signal can indicate, among other things, the presence or absence of a flame;
and

determining means for determining if the output signal of the flame sensor indicates that the flue is at least partially blocked.

18. (original) The controller of claim 17, wherein the determining means compares a value related to the output signal of the flame sensor to a reference value.

19. (original) An HVAC system comprising:
an oil burner disposed within a chamber having a flue;
a flame sensor disposed to optically monitor a flame produced by the oil burner; and
a controller adapted to receive and monitor an output signal of the flame sensor, and for determining if the output signal of the flame sensor indicates that the flue is at least partially

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blocked.

20. (currently amended) A controller-readable medium having program stored thereon, such that when executed by a controller of an HVAC system having a burner that produces a flame, a flue for providing an exhaust for the burner, and a flame sensor for monitoring the flame of the burner, the controller is capable of performing the following steps:

- receiving a flame value related to the flame sensor output;
- during an ignition sequence, using the flame value to determine if a flame is present, and if a flame is present, allowing the HVAC system to continue;
- comparing the flame value to an acceptable flame value range; and
- if the flame value is outside of the acceptable flame value range, indicating that the flue may be at least partially blocked.

21. (original) The controller-readable medium of claim 20 wherein the acceptable value range comprises a range about a reference value, the program, when executed by a controller, also being capable of performing the steps of:

- determining whether, during a specified time period, the flame value has been stable within predetermined limits; and
- if the flame value has been stable within the predetermined limits, adjusting the reference value to be closer to the flame value.

22. (original) An HVAC system comprising:

- an oil burner disposed within a chamber having a flue;
- a flame sensor having a flame sensor output, the flame sensor adapted to optically monitor a flame produced by the oil burner; and
- a controller adapted to determining whether, during a specified time period, a flame value that is related to the flame sensor output has been stable within predetermined limits; and
- if the flame value has been stable within the predetermined limits, adjusting the reference value to be closer to the flame value.

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23. (original) An HVAC system according to claim 22 wherein the flame value is an average of two or more flame sensor output values.

24. (original) An HVAC system according to claim 23 wherein the reference value is an average of two or more flame sensor output values.

25. (new) A method of determining whether a flue is at least partially blocked in an HVAC system that includes a burner and a flue, wherein the flue serves as an exhaust port for the burner, the method comprising:

monitoring the intensity of a flame of the burner using a flame sensor that produces a flame sensor output, and determining a flame value that is related to an average of the flame sensor output taken at different times; and

determining if the intensity of the flame of the burner likely corresponds to an at least partial blockage of the flue.

26. (new) A method of determining whether a flue is at least partially blocked in an HVAC system that includes a burner and a flue, wherein the flue serves as an exhaust port for the burner, the method comprising:

monitoring the intensity of a flame of the burner using a flame sensor that produces a flame sensor output, and determining a flame value that is related to the intensity of the flame;

determining if the intensity of the flame of the burner likely corresponds to an at least partial blockage of the flue by comparing the flame value to a reference value;

observing the flame value at a first time and a second time; and

if the flame value varies by less than a predetermined amount from the first time to the second time, resetting the reference value to the new reference value.

27. (new) A method of determining whether a flue is at least partially blocked in an HVAC system that includes a burner and a flue, wherein the flue serves as an exhaust port for the burner, the method comprising:

monitoring the intensity of a flame of the burner and determining a flame value that is

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related to the intensity of the flame;
comparing the flame value to a reference value;
determining a difference between the flame value and the reference value;
if the difference exceeds a predetermined threshold for a predetermined duration of time,
determining that the flue is blocked.

28. (new) A method of determining whether a flue is at least partially blocked in an HVAC system that includes a burner and a flue, wherein the burner is disposed in a chamber, and wherein the flue serves as an exhaust port for the burner, the method comprising:

monitoring the intensity of a flame of the burner by optically observing the intensity of light in at least part of the chamber; and

determining if the intensity of the flame of the burner likely corresponds to an at least partial blockage of the flue.

29. (new) A controller-readable medium having program stored thereon, such that when executed by a controller of an HVAC system having a burner that produces a flame, a flue for providing an exhaust for the burner, and a flame sensor for monitoring the flame of the burner, the controller is capable of performing the following steps:

receiving a flame value related to the flame sensor output;

comparing the flame value to an acceptable flame value range;

if the flame value is outside of the acceptable flame value range, indicating that the flue may be at least partially blocked;

determining whether, during a specified time period, the flame value has been stable within predetermined limits; and

if the flame value has been stable within the predetermined limits, adjusting the reference value to be closer to the flame value.

30. (new) An HVAC system comprising:

a burner for selectively providing a burner flame;

a flue serving as an exhaust port for the burner;

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a sensor for monitoring the burner flame, the sensor providing a sensor output that indicates an intensity of the burner flame;

a controller coupled to the sensor, the controller monitoring the sensor output and determining if a burner flame is present after ignition of the burner, and if a flame is present, allowing the HVAC system to continue;

the controller also monitoring the sensor output and determining if the intensity of the burner flame is outside of an acceptable limit, indicating that the flue may be at least partially blocked.